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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/644,269	08/19/2003	Stephan E. Lassig	LAM1P111.CIP	7489
25920	7590	09/26/2005	EXAMINER	
MARTINE PENILLA & GENCARELLA, LLP 710 LAKEWAY DRIVE SUITE 200 SUNNYVALE, CA 94085			BARRECA, NICOLE M	
			ART UNIT	PAPER NUMBER
			1756	

DATE MAILED: 09/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/644,269

Applicant(s)

LASSIG ET AL.

Examiner

Nicole M. Barreca

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,6-13,16,17 and 20-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,6-13,16,17 and 20-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-3, 6-13, 16, 17, 20-22 are pending in this application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 2, 6-12, 16, 20, 21 are rejected under 35 U.S.C. 102(e) as being anticipated by Okoroanyanwu (US 6,475,904).
5. A first low k dielectric layer 52 is formed on interconnect layer 50 and conductor 51 to a thickness of 7,000 angstroms. The low k dielectric layer may be a suitable material such as BCB, HSQ or FLARE having a dielectric constant less than 4.0. An imageable layer of alicyclic polymer 54 is formed to a thickness of 50-400 nm (500-4,000 angstroms). Via pattern 56 is patterned into the imageable layer. A liquid silylation step

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is performed to incorporate silicon into the imageable layer. Low k dielectric layer 52 is etched to create via opening 58. The oxygen plasma etch also converts the silicon rich regions 53 of the imageable layer 54 into a hard mask 55. After via hole is filled with conductive material, a second low k dielectric layer 62 is spun in the hard mask. The second low k dielectric is of the same thickness and material as the first low k dielectric layer. Second imageable layer 64 is formed of a thickness of about 250 nm (2,500 angstroms) and patterned to form trench opening 66. The second imageable layer is silylated to form hard mask 65. An oxygen etch transfers the trench 68 to the second low k dielectric layer. See col.5, 26-col.7, 20 and Figures 3A-3K.

6. Claims 3, 13, 17, 22 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Okoroanyanwu (with Li (US 6,057,928) cited to show inherent properties).

7. Okoroanyanwu teaches that the low k dielectric material may BBC, HSQ or FLARE, but does not explicitly disclose that the dielectric constant is below about 3.0. Li teaches that the dielectric constant of FLARE polymer is 2.8 (col.8, 61-62). One of ordinary skill in the art would have expected that the low k dielectric layers in Okoroanyanwu had a dielectric constant below about 3.0 because Okoroanyanwu teaches FLARE as an example of a low dielectric constant material used and Li teaches that the dielectric constant of FLARE polymer is 2.8.

8. Claims 20, 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Konshi (US 6,001,739).

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9. An organic insulating layer of a low k dielectric material is formed on a substrate, followed by a photoresist layer. The photoresist is exposed and developed to form a pattern. The photoresist is then silylated by exposing it to a source of HMDS (silicon source) and an oxygen containing plasma. The pattern is then transferred to the insulating layer. See abstract, col.5, 1-col.6, 13 and Figures 2A-2G.

10. Claims 1-3, 6-13, 16, 17, 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leuschner (US 5,556,812) in view of Nguyen (US 6,096,634).

11. Leuschner teaches a method for manufacturing multichip modules having layer sequences made of dielectric material. Example 1 teaches the use of a silicon wafer having a copper layer applied over its entire surface. A silicon dioxide layer is applied to the said copper layer as an etch stop layer. The silicon wafer prepared in this manner serves as a substrate. A polybenzoxazole (PBO) layer is applied as a dielectric layer having a dielectric constant of 2.8 and a thickness of 9 μm (9000 angstroms). A layer of resist based on polyglutarimide is applied by spinning to the dielectric layer. Then, a 0.8 μm (8000 angstroms) thick layer of silylatable resist based on an anhydride group-containing polymer is applied by spinning. After exposure and development, silylation is done at room temperature. Using a plasma etching system the formed patterns are transferred into the PBO layer. A second layer of PBO is applied by spinning to the structured Cu/PBO layer. A layer of silylatable resist is then applied and exposed to form a via hole pattern. The pattern is then silylated and transferred to the PBO layer. The etching process terminates at the copper layer situated hereunder. See col. 7, 66-col. 9, 7 and examples 2 and 3. Leuschner does not disclose that the resist layer has a

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thickness of about 500-2,500 angstroms. Nguyen teaches that thinner resist layers will result in smaller features (col.1, 29-31), thereby teaching that the thickness of the resist layer is a result-effective variable. It would be within the ordinary skill of one in the art to determine the film thickness of the resist layer in the method of Leuschner '812 by routine experimentation and to have a thickness of 500-2,500 angstroms, if required, because the thickness of a photoresist layer is a result-effective variable, as taught by Nguyen and the discovery of an optimum value of a result effective variable is ordinary within the skill of the art, as taught by *In re Boesch*, (617 F.2d 272, 205 USPQ 215 (CCPA 1980)).

Response to Arguments

12. The 35 USC 102 and 103 rejections of claims 1, 2, 6-8, 12 and 20-21 over Catabay have been withdrawn in response to the applicant's amendments requiring the hardening to include exposure to oxygen plasma in the independent claims.

13. Applicant's arguments, see p.9-10 and 12, filed 6/27/05, with respect to the Leuschner 6,042,993 have been fully considered and are persuasive. The 35 USC 102/103 rejections of claims 1-24 using this reference have been withdrawn.

14. Applicant's arguments with respect to the Okoroanyanwu, Konshi and Leuschner 5,555,812 references have been fully considered but they are not persuasive. The applicant argues that the references do not disclose that the surface imaging material has silicon incorporated therein. However the references do teach incorporating silicon into the resist layer using a silylation process and therefore meet the claimed limitations. The claims as written do not require how or when the silicon is incorporated into the

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resist layer. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

15. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

16. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 571-272-1379. The examiner can normally be reached on Monday-Thursday (9AM-7PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F. Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nicole M Barreca
Primary Examiner
Art Unit 1756



9/17/05